Stimulating the Division of Innovative Labor by Competition for R&D Subsidies – A New Approach in German Innovation Policy

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Abstract

The paper deals with a new approach in German innovation policy that organizes contests of initiatives for public funds. Based on an overview of the different programs we investigate the advantages and problems of such an approach. We find that this type of policy may have a large impact and can, therefore, be regarded a rather efficient instrument of innovation policy. Compared to conventional policies implementation is a much more critical issue. The contest approach may require more flexibility on the side of the administration, particularly with regard to the design of the assistance. The main disadvantage is the additional time that is required for conducting the contest. As a distinct "picking the winner" instrument it is not suited as a means for achieving a leveling-out of welfare levels.

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1. Introduction

A new approach has emerged in German innovation policy. The main novelty is that the allocation of pubic support is based on competition between initiatives for self-organized cooperation in Research and Development (R&D). In programs like BioRegio (Dohse, 2000, 2003), EXIST, InnoRegio (Eickelpasch, Kauffeld and Pfeiffer, 2002) and InnoNet (Belitz, 2003), a Federal Ministry invites local groups or 'networks' of actors to submit proposals for cooperative R&D projects with the prospect of attaining support for implementing the proposal. The submitted proposals are evaluated by a jury that selects those initiatives that appear to be most promising. The selected projects then receive public support. In most cases the actors of the competing initiatives are supposed to be located in a certain region.

This paper provides a discussion of this new approach with its potential merits and demerits. Section 2 gives an outline of basic elements of the new approach. Section 3 deals with some justification of the new policy. Potential advantages, problems and limitations of allocating R&D subsidies by competition are outlined in section 4. Section 5 reviews the organization and the conditions of selected programs. Practical experiences with this kind of policy are reported in section 6. Final evaluation and conclusions of this new approach to technology policy follow in section 7.

2. Competition of concepts for innovative labor division: the basic approach

Since the mid-1990s German innovation policy has increasingly applied competitive elements, particularly for a promotion of cooperative R&D (BMBF, 2002). The common aim of these new programs is to stimulate the division of innovative labor and thereby to mobilize potentials for innovation and creativity (BMWI, 1999). This is done by conducting a contest of concepts for the organization of cooperation within 'networks'. In most of the programs the procedure consists of three steps:

- *Stage I:* Groups of actors are invited to submit a proposal for a concept to organize cooperative innovation activity with the prospect of gaining a subsidy. The proposal has to show the future development of the technology and the relevance for market realization, the strengths of the regions and the participants and should make clear the chances of success. In most cases only a rough outline of the concept is required in the first stage.

- *Stage II* is selection of proposals for further elaboration and final funding. In most of the programs under review here, the selection of concepts was organized in two rounds. In a first round outline of concepts were called for. A selection of these concepts was invited to participate in a second round of the contest in which initial concepts had to be further elaborated. While there is no direct compensation for the effort of developing the initial first-round proposal, the elaboration of the second-round application is usually supported by advice and public funding. The final selection was then made from the more elaborated concepts that came out of this second round.

- *Stage III* is the realization of the proposals over a longer period of time.

The second stage of the contest gives the administration the opportunity of providing custom-tailored support in developing the concept and maybe steering the application in a certain direction that is favored by the administration.

In most of the contests that have been conducted so far only a relatively small share of initial applications have been selected for funding (see section 6 for details). In quite a number of cases, however, the administration that had organized the initial contest or another public body has launched further programs – frequently again in form of a contest – that were specifically designed for losers of the initial competition. These follow-up programs may be regarded a fourth stage of the new approach.

3. Foundations of the new program type

There are three strands of argument that may provide a theoretical foundation for the policies under inspection here. One of these possible foundations is the recent approaches to explain innovation behavior, particular in a regional context (section 3.1). The second one is the theory of network-relationships that is mainly based on the notion of uncertainty and transaction cost (section 3.2). And a third element of such a theoretical foundation could be the theory of regional systems competition (section 3.3).

3.1 Theories of innovation behavior

Innovation activity is characterized by a pronounced division of labor and there are indications that the intensity of labor division has increased considerably in the last few decades (Arora and Gambardella, 1994; Hagedoorn, 2002). This division of innovative labor tends to be considerably shaped by geography (Fritsch, 2004). One indication for the importance of location is the clustering of innovation activity found in many empirical studies.[1] Clustering suggests that there are agglomeration advantages at work that stimulate R&D (Enright, 2003; Porter, 1998). Among the most important of these agglomeration advantages are a relatively high potential for face-to-face contacts within clusters, the presence of positive external effects (e.g., knowledge spillovers), easy access to research institutions as well as to differentiated input markets such as the labor market and the market for specialized services. All these factors may facilitate the generation and the transfer of knowledge which constitutes a key element of innovation activity. Another indication for a significant role of location for R&D is the evidence that the spread of new knowledge tends to be heavily concentrated around its source. Obviously, spatial proximity is of significant importance for such knowledge flows and is,

[1] For empirical evidence see Audretsch and Feldman (1996a), Cooke (2002, 130-156), Baptista and Swann (1998), Feldman (1994), Porter (1998), Prevezer (1998), Scott (1996), Shohet (1998), Swann (1998).

therefore, conducive for a division of innovative labor that necessitates knowledge transfers between the parties involved.

That innovation processes have a pronounced regional dimension implies that the quality of regional innovation systems may differ considerably. According to a simple centre-periphery paradigm that can be traced back to the work of Hägerstrand (1967) the level as well as the success or efficiency of innovation activity should be higher in the centre than in more remote areas or in regions characterized by a relatively low degree of agglomeration. However, there are numerous empirical examples of small clusters in remote areas with low population density where innovation activity is highly effective (Porter, 1998; van der Linde, 2003). This suggests that only a fraction of the differences in the efficiency and the success of R&D can be attributed to the sheer size of an agglomeration or cluster. Accordingly, more recent approaches to a theory of regional innovation[2] share the common hypothesis, that the main factor for explaining the quality of regional innovation activity is not size or endowment but the level and the quality of interaction within and between regional innovation systems. This interaction may constitute an important vehicle for knowledge spillovers that constitute a necessary precondition for a division if innovative labor. Therefore, stimulating the division of innovative labor could be a promising starting point for a policy that aims at promoting regional R&D activity.

3.2 Specific problems of labor division in R&D

Although the establishment of exchange relationship may not be considered a bottleneck for labor division with regard to 'normal' production activity it could constitute a serious hurdle for interaction in the field of R&D (see Fritsch 2001 for an overview). One reason why interaction for mutually beneficial

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[2] These recent approaches are the notion of innovation systems (cf. Lundvall, 1992; Nelson, 1993; Edquist, 1997), the concept of industrial districts (cf. Porter 1998 and the contributions in Pyke, Beccatini and Sengenberger, 1990), the network approach (cf. Camagni, 1991; Grabher, 1993), and the concept of "innovative milieux" (Crevoisier and Maillat, 1991; Ratti, Bramanti and Gordon, 1997).

division of innovative labor may be difficult to establish is that relationships in R&D processes can not be completely specified since the result of an innovation process is unknown in advance. Because such incomplete contracts include the danger of the exchange partners behaving in an opportunistic way, establishing such relationships requires some trust. This implies that actors can not be completely anonymous to each other. They must be 'linked' (Kranton and Minehart, 2001), i.e. they have to spend some actor-specific transaction cost. This cost may be incurred while identifying a suitable transaction partner, when establishing an appropriate interface for the exchange relationship and/or by building up some reputation and trust in order to reduce the danger of opportunistic behavior to a reasonable level.

Another reason why a division of innovative labor may necessitate investment in actor-specific transaction cost is that the required inputs are often highly specialized, and not commonly traded on large markets. Indeed, markets for skills and resources that are important for an innovation process may well be rather 'thin' with only very few suppliers available and transactions taking place rather infrequently. Because suppliers are rare, an immense amount of search costs could be required for identifying a suitable transaction partner. Moreover, if only few transactions take place it may be hardly possible to identify a market price, so that negotiations about the conditions of an exchange tend to be rather costly.

For these reasons, exchange relationships in the field of R&D require some actor-specific investment and, therefore, tend to be long-term and co-operative in nature. If such cooperative relationship comes about it may have even more advantages than intensified division of innovative labor and increased efficiency of R&D processes. One such further advantage of R&D cooperation is that the relationships could involve relatively 'open' exchange of information that may be stimulating for R&D activity.[3] This can particularly pertain to the transfer of tacit knowledge that is not completely codified.

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[3] See for example Axelsson (1992), Lundvall (1993), and Powell (1990).

Therefore, cooperative relationship in R&D may work as an important medium for knowledge spillovers. Many authors suggest that not only formalized cooperative relationships like joint ventures or contract research are important for such knowledge spillovers, but that informal relationships like “information trading” (reciprocal exchanges of information between personnel of competing firms) often play a significant role for stimulating innovation activity (e.g., von Hippel, 1987; Saxenian, 1994).

Because mutually beneficial modes of labor division in the field of R&D do not emerge more or less automatically, it may be promising for innovation policy to support the establishment of such cooperative relationship. This pertains to formalized relationship as well as to rather informal types of interaction that may be conducive for innovation processes. The appropriate means for stimulating interaction within regional innovation systems are, however, largely unclear. This pertains particularly to stimulation of the more informal modes of interaction and exchange.

3.3 Systems competition

Problems and regions may have specific characteristics so that a centrally designed one-size-fits-it-all-approach does not represent the best possible answer. Therefore, variety may be required for obtaining appropriate solutions that work sufficiently well. Yet if different ways to approach a certain problem or to organize certain activities exist, competition between the alternative means may help to identify the best solution. Moreover, competition could fuel the search for the most efficient and appropriate approach. It may particularly stimulate the imitation and diffusion of superior solutions. This is a key argument in the theory of federalism or, more generally, systems competition (Frey and Eichenberger, 1999; Vanberg and Kerber, 1994).

A basic precondition for such competition is variety. There should be room for different solutions to emerge. This implies that political programs are designed in an way that leave the actors sufficient degrees of freedom that allow them to develop the problem solving methods they deem appropriate to

their particular needs. In case of policies at a regional level this should particularly be the case because regional actors tend to know the specific problems in their region much better than actors at a central level. One could, therefore, expect that decentralized innovation policies, e.g. operated at a regional level, should be more appropriate than a completely centralized approach. Due to variety of approaches, competition can be expected to have a stimulating effect on the search for adequate solutions. With regard to regional innovation systems or networks, the definition of what is the respective region must not necessarily follow administrative criteria but could be specific and account for the locations of all the relevant actors (Frey and Eichenberger, 1999). Therefore, a policy that is aiming at stimulating regional innovation systems may leave the delineation of the respective region to the respective actors.

In summarizing the arguments that were briefly reviewed in this section, there are good grounds to suggest a decentralized approach to innovation policy that tries to stimulate the diverse kinds of innovative labor division. The theory of federalism or systems competition proposes to leave main degrees of freedom with regard to the design of such a policy to a lower level. There are strong arguments to expect that competition of different solutions could help to identify the superior alternative. Competition may also stimulate imitation and diffusion of the best suited solutions.

4. Advantages and disadvantages of the contest approach

The programs under review have a number of important advantages over conventional innovation promotion measures. These possible merits of the new approach are explicated in section 4.1. We then deal with possible disadvantages (section 4.2) and limitations (section 4.3). Our point of reference for identifying the merits and demerits of the new approach is the common practice of allocating financial support to submitted applications that fulfill the requirements of a certain program. If any judgments have to be made, particularly if the program includes discretionary elements, the decisions are

made case-by-case. They are not based on a comparison and a ranking of all submitted applications like in a contest.

4.1 Advantages

Compared to the standard procedure of allocating R&D support the new type of program provides a whole number of advantages.

- *Self-organizing the division of innovative labor:* One main advantage of the approach is that applicants have certain degrees of freedom in choosing the organizational form of innovative labor division that appears appropriate to them. Hence, policy makers largely avoid the pretence of knowledge-problem. The degrees of freedom that applicants have for the design of their project is in the very nature of the approach because if all submissions were identical a contest would not make any sense. Because the applicants are designing the relevant network by themselves, they also give a definition of the extent, e.g. the regional dimension of the network. Therefore, no predetermined delineation according to administrative criteria is necessary as would be the case in a program in which the availability of funds is limited to certain assisted areas that may be too small to include all relevant actors or sources of knowledge spillovers. Hence, there must not be any artificial discrimination against certain potential members of the network due to administrative criteria.[4]

- *Mobilization of innovative potential:* A further important advantage of the contest approach is that it can generate relatively strong mobilization effects. Due to the considerable freedom that a contest leaves regarding the design of cooperation, it may stimulate actors to figure out how a new form of innovative labor division could be organized or in which way the existing forms could be improved. The competition approach is, therefore,

[4] However, some spatial restrictions may apply. In most of these programs partners located far away from the network-'core' were not eligible for funding. In the InnoRegio program, for example, funding was limited to actors located in East Germany. And as a general restriction of German innovation policy, financial support is not granted to actors located abroad.

more likely to stimulate creativity and the generation of ideas than conventional assistance policy. This may be particularly relevant in regions with a relatively low level of innovation activity where conventional programs for stimulating R&D find only few occasions for funding and can, therefore, have an only limited effect.

- *Quality enhancing effects of interregional competition:* The general expectation that competition generates incentives for a high level of performance may also hold for the concepts submitted in a contest. This competition is considerably more pronounced than in a conventional program with case-by-case decisions because all applications are compared at a certain time.

- *Learning effects for applicants:* The selection procedure may induce learning processes. Even if the information output of the selection procedure is just a "yes" or "no"-decision, this entails the information that the proposal was good enough or not good enough to meet the relevant requirements. If the feedback contains more information such as comments, demands for alterations etc. this may lead to considerable learning processes on the side of the applicants. The more profound and detailed the feedback for applicants on their proposal the higher the potential learning effects. This can be relevant for all kinds of applicants, winners and losers. The intensity and the quality of the feedback depend critically on the implementation and management of the contest.

- *Selection quality:* The contest approach makes it much easier to allocate R&D funding to the most promising projects than is the case with a conventional approach that is characterized by case-by-case decisions. In the conventional approach the administration decides according to the relevant rules and to budget constraints whether to grant funding or not whenever an application is submitted. It is a main characteristic of this conventional approach that, at the time a decision about funding is made, the administration does not know if later application will be of higher or lesser quality. This limits the possibilities of selecting the most promising projects considerably. The contest mode of selection is to decide about

subsidies at a time when all competing applications are known and can be taken into consideration in order to select the most promising ones. Therefore, selection decisions can be of higher quality because they are capable of more relevant information than the conventional approach of case-by-case decisions. And if decisions are made by an independent jury of experts the quality of the selection may also be higher as compared to decision by a public administration due to the superior expertise of the jury.[5]

- *Relatively high impact of public funds:* Because it is in the very nature of a contest for R&D funding that not all applications will win and attain public assistance, the impact of the program in terms of mobilization of creativity and innovative potential could affect considerable more programs than are finally funded. Due to such a 'mobilization surplus' the impact of a contest may be particularly higher than for a conventional program of the same budget size which just reaches out subsidies. Hence, the public resources are probably spent more effectively than in conventional innovation promoting programs.

- *Even losers may benefit:* The mobilization surplus of the contest-type programs is closely connected with the benefits of losers. One of the potential benefits from participating in the contest that remains for those applications that were not selected is the concept that may constitute a basis for further action. Even if an initiative fails to gain public support actors may try to realize at least a part of their ideas without public support in one or the other way. Hence, even the losers in the competition may gain something. Also feedback on the submitted concept and contact that was established to potential cooperation partners while preparing the proposal may proof to be of future value.

- *Learning effects for policy makers and public administration:* In the contest approach, innovative actors must necessarily have considerable degrees of

[5] For experiences with peer reviews see Sturm (2003).

freedom for designing their proposal. They can be expected to use these degrees of freedom for expressing their ideas that reflect their specific needs and desires. Policy makers and the public administration may, therefore, have good opportunity to learn so they are able to design more appropriate programs in the future.

- *Publicity and transparency of decisions:* As contests may be addressed to a wider group of potential applicants than conventional programs the decisions tend to be subject to much more attention and publicity. By that, the pressure for justification of decisions is higher and may induce a more transparent design of decision procedures. But also the opposite effect may occur that public pressure induces attempts to conceal the details of the decision process.

4.2 Disadvantages

Besides these possible merits of the contest approach to R&D incentives there may also be occur some of the following disadvantages as compared to conventional policy measures for stimulating innovation activity.

- *Relatively high organizational effort for administration*: Conducting a contest policy may well require much more time and resources than is needed for a conventional program. This may particularly hold if there is a jury involved in the selection procedure.

- *Organizational effort for applicants:* Not only policy makers but also applicants may have to spend more effort participating in a contest as compared to a case-to-case selection. The above mentioned quality enhancing effect of competition may require more resources for preparation of a promising application than in case of a conventional R&D subsidy. This may particularly hold if the application has to include not only an R&D project but also a concept for organizing the division of innovative labor in a network of actors, as is the case in many of the contest-type programs reviewed above. Developing a concept for joint R&D will necessitate the identification of potential partners, their selection and the

ex-ante coordination of the project. If, however, only a rough outline is required in the first stage of the contest, the effort of application may be much smaller then in regular programs.

- *Need of time for the contest:* Conducting a contest may be more time-consuming than administrating a conventional program of R&D subsidies. Therefore, time and first-mover advantages that otherwise could be used for starting and realizing the intended innovation project may be lost.

- *Discouragement and discrimination of losers:* If a contest has winners there are also losers. These losers may keep considerable benefits from participating in the contest (see section 4.1 above) but they could also find themselves 'punished' in several ways. First, although they could have learned something in the process of application, at least a part of their effort for the application procedure was in vain. Second, losers in the contest may suffer from bad reputation of not being selected. And third, because the 'winners' in the contest get public support for their R&D, those firms that are not rewarded in this way have a competitive disadvantaged (Dohse 2000). This could be especially dubious when the differences in the quality of concepts were not very significant.

- *Relatively high administrative flexibility required:* It constitutes a basic requirement of any contest that the participants have some degree of freedom in the design of their concepts. The search for concepts constitutes a discovery procedure the results of which can not be predicted. Therefore, the implementation of a winning concept may require new modes of support or administrative innovation and learning. While the respective administration may feel this pressure for more flexibility to be a disadvantage it could also be regarded an advantage from a broader perspective.

- *Relatively high pressure on administration:* We have argued that publicity pressure of the contest may lead to relatively high quality of the selection procedure. This pressure can be rather uncomfortable for the administration inducing attempts of avoidance.

4.3 Limitations of the approach

The contest approach is, by its very nature, a 'picking the winner' procedure and is, therefore, not well suited as a means of policies that aim at leveling-out of welfare levels. Due to the distinct 'picking the winner'-character of the approach it is rather unlikely that support goes to the less able applicants or the lagging regions. Therefore, the policy is likely to lead to an increase of welfare differences and not a decrease. The procedure would be perverted if used to pick the most needy applicants because in this case applicants would compete for the lowest-quality application.

Limiting the competition to certain types of applicants or to a part of the country which is economically backwards (like the InnoRegio program that is limited to East Germany, see section 5 below) does in no way change this bias towards supporting the most promising initiatives. With a quality-oriented selection mechanism, nothing favors proposals that come from the most needy applicant or most lagging region. For supporting less favored initiatives or regions, other measures of a more enabling character must be found.

4.4 Intermediate conclusions: implementation matters

Compared to a conventional policy that allocates support on basis of case-by-case decisions the contest approach has a number of advantages. Compared to these merits the demerits appear to be of less importance so that a positive net-effect remains. It is a clear weakness of the contest approach that conducting such a contest may require considerable resources and that more time from application to receipt of funding may be needed than with a conventional policy. But the length of this period depends on the way the policy is implemented and managed. The same holds for a number of the advantages that depend critically on the administration of the program like selection quality, learning effects for the applicants and public administration.

It is not quite clear from the conceptual point of view in how far the policy should care for the losers of the contest. We have argued that even the losers

may benefit from participating in the contest because they could try to use their ideas and maybe received valuable feedback during the procedure. Helping the loser could be regarded favorable if they would not be able to realize good ideas without public support. It could also appear reasonable if the quality of the winning and the loosing proposals is very close so that funding of winners only leads to considerable distortion of market competition.

5. The programs under review: a selective overview

In this section we give an overview of the new type of German innovation policy program. These programs have two special characteristics. First, stimulating cooperation or networks as a way to strengthen the innovation potential of actors involved. And second, the supported initiatives are selected by means of a contest. Some of the programs are focused on a certain technological field; others are more general and have no such specific technological orientation. Most of the programs were initiated by the Ministry of Education and Research (BMBF). Only two of them have been launched by the Ministry of Economics and Labor (BMWA). It should be mentioned, that there are still other programs focused on R&D cooperation and innovative networks in operation which are not based on contests as a selection mode (e.g., the ProInno program).

- *BioRegio* was the first program of this type in Germany (Dohse, 2000). Its apparent success paved the way for other programs of this kind. The BioRegio program was launched by the BMBF in the year 1995 with the aim of strengthening German biotechnology industry and, thus, to catch up with the leading nations in this field, the US and the UK in particular. The BioRegio contest was designed to stimulate cooperation and division of innovative labor between private firms, universities, non-university research institutes, and venture capitalists in a certain region. Proposals for this program were required to outline the strengths of the regional biotechnology sector and to make propositions for its future development, particularly for research projects and the regional cooperation. The basic idea of this program dates back as far as to the early 1990's. There were no

restrictions with regard to the number of participants or the definition of the respective region. An independent international jury with representatives from science, industry and labor unions selected four winning initiatives according to a detailed list of 9 criteria provided by the ministry. The criteria by which the regions were picked out were the economic and research potential of the regions (companies, universities, research and supporting service facilities), the interregional interaction, the planned strategies (converting research results into new products, support of start-ups, role of banks and of local authorities). The selection was completed November 1996. These regions obtained preferential access to federal funding of 90 Mill. Euro for the years 1997 to 2002 for realizing their proposed projects. In fact, due to late approval some projects will run until the end of the year 2005.

Although there was no official complementary evaluative research for the BioRegio program it was soon regarded a promising success (Dohse 2000). The widely acclaimed success of BioRegio worked as a main motivation for the setting up of other programs like BioProfile, BioChance, BioChancePLUS or BioFuture. In this connection also losers of BioRegio got a second chance for promotion. Most of the succeeding programs were contest-based as well.

- The *BioProfile* program started in November 1999 and drew some benefits from experiences of the BioRegio contest. Regions with high potential for commercialization of know-how in a self-defined field of biotechnology could apply for promotion. In phase 1 the regions were expected to develop their concept: defining their specific aims and the geographical extension of their network, identify the research institutes as well as the private firms to cooperate with, expose their expertise and the economic impact of the results to be expected. One of the partners had to act as the coordinator of the initiative. Applications were to be submitted until March 2000. According to the published guidelines for applicants up to 20 of the submitted applications were to be selected by an independent jury for further elaboration. This further elaboration was financially supported by

the ministry. In a second round of the contest, three out of the 20 applications were selected for phase 3, which started in July 2001. In the course of five years the winning regions are promoted for realizing their proposed research projects.

- The *BioFuture* program, implemented in the year 1999, was also based on the BioRegio experiences. The aim of this program is to stimulate basic research in biosciences and to enhance the career prospects of already experienced high qualified young scientists. Public supported is granted to research projects conducted by groups of young German or foreign scientists hosted by German universities or non-university research institutions. In this program an initial project outline has to be submitted that is evaluated by an independent jury. The selected proposals are invited for a second round in which the proposal has to be elaborated supported by some financial funding. The jury as well as external experts evaluate the application. The program is scheduled until the year 2010.[6]

- The aim of the *EXIST* program that was introduced in December 1997 is to improve the knowledge transfer between universities and the commercial sector by promoting entrepreneurship and encouraging start-ups of students and personnel[7]. In its initial form the EXIST program invited for proposals of concepts to stimulate new firm formation out of universities. These proposals were supposed to entail cooperation between universities and other actors in the respective region. EXIST sponsors activities in networks to improve the climate for start-ups at universities and to motivate, train and support entrepreneurial personalities, students, employees and graduates. The networks consist of universities and at least two external partners like institutions of the academic community, private enterprises or chambers of commerce and associations. Each network is funded with about 1 Mill. Euro for three years. The contest consisted of two steps. First,

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[6] For further information concerning the three programs see URL http://www.bioregio.com

[7] For further information see Kulicke (2003) and URL http://www.exist.de.

a project outline had to be submitted. An independent jury with representatives from the academic community, the business and the finance sector selected those proposals that were invited to submit a more elaborated concept. The jury also acts as a board of experts that accompanies the whole program.

Table 1: Selected contest oriented programs in support of regional R&D co-operation in Germany

Name	*Objective*	*Support for*	*Funding of innovation activity*	*Funding of network management*	*Professional advice*	*Term of promotion*	*Budget (Euro)***	*Rounds of contest*	*Selection committee*
"BioRegio"	regional cooperation in biotechnology	private firms & public research institutes	X	X		1997 - 2002	90 mill.	2	jury
"BioProfile"	regional cooperation in biotechnology	Private firms & public research institutes	X	X		1999 - 2006	50 mill.	2	jury
"BioFuture"	cooperation in biotechnology	national and international scientists at German research institutes	X			1999 - 2010	75 mill.	2	jury
"EXIST"	regional cooperation	at least three partners thereof one university		X	X	1997 - 2005	.	2	jury
"EXIST Transfer"	regional networks of start-ups	at least three partners thereof one university		X	X	2002 - 2005	10 mill.	2	jury
"InnoRegio"	regional networks of a priori not specified innovations	private firms & public research institutes	X	X	X	1999 - 2006	253 mill.	2	jury
"NEMO"*	cooperation in R&D	private SMEs & public research institutes		X	X	2002 - 2006	3 mill.	2	ministry
"InnoNet" *	cooperation in R&D	private SMEs & public research institutes	X			1999 - 2005	33 mill.	2	administration, jury
„kompetenznetze.de"	networks in innovation	network administration		X		n.a.	n.a.	n.a.	advisory board
„Lernende Regionen"	regional networks in innovation	private firms, schools, public research institutes etc.	X	X		2000 - 2006	118 mill.	2	steering committee

* Sponsored by the BMWA, all the others by the BMBF. ** Planned/ used until end of 2003.
sme: small and medium-sized enterprises. pri: publicly funded research institutes.
Source: Own compilation.

- The *EXIST-Transfer* program is rather similar to the initial EXIST program program. Applicants (universities) had to submit their proposals until the end of January 2002. The concepts should show in how far the initiative utilizes experiences from the initial EXIST program. At the end of March 2002 the applications for the second round of the selection procedure were recommended by an independent jury. As a result of this second round ten regions were selected for the implementation phase which began in June 2002 and lasts for about three years.

- The *InnoRegio* program was launched by the BMBF in April 1999. The aim of the program was to strengthen innovative and economic competitiveness in selected regions of East Germany, that part of the country that had been under socialist regime until 1990. The contest requested concepts for regional innovation networks. The InnoRegio program was limited to East Germany but not to certain industries or technologies. Besides the restriction to East Germany the spatial delineation of regions participating in the contest was not in any way pre-determined. Prospective participants from numerous professional areas like science, business, education, administration etc. were invited to enter the competition for promotional funds by submitting concepts for the development of regional innovation networks. The winning proposals were chosen in two rounds. The program's initial request for proposals explicitly stated that a maximum number of 50 concepts will be chosen for the second round of the selection procedure and that a maximum of 25 will finally gain funding in the third stage.

  The initial qualification phase ran from April to October 1999, when applying regional network initiatives put forward their first concepts. In November 1999 an independent jury chose those 50 proposals that were included in the second round of the contest. Main criteria for this selection were the importance of the network for the region, complementarities of participants in the proposed network and the innovative quality of the planned R&D. Those network initiatives that were selected for the second stage of the contest were awarded up to about 153,400 Euro per initiative

for preparing a more detailed version of their concept. In this second round the InnoRegio-initiatives were also provided with immaterial support from the Ministry in form of moderators who monitored the communication and organization process as well as with free consultancy on subject areas and technical aspects of the promotion. The elaborated concepts had to be submitted by the end of June 2000. In October 2000 the jury decided on further promotion and selected 25 concepts for realization in the third stage. In this third stage of the program, the Ministry provides financial assistance of overall 253 mill. Euro over a period of five years (from the end of the year 2000 to the end of 2006). Activities eligible for funding are R&D projects as well as qualification measures conducted by private firms, universities and other public research institutes jointly or on their own. In addition, the management of the network is supported financially.[8]

InnoRegio was the first initiative in a whole string of initiatives aiming at improving regional innovative networks in the new Länder. The program "Interregionale Allianzen für die Märkte von morgen" supports regional networks during the phase of constituting, the program "Regionale Wachtumskerne" started in 2001 as a program similar to InnoRegio, and the program "Zentren für Innovationskompetenz" promotes since 2002 the international co operation of universities.

- In 1999 the Ministry of Economics and Labor (BMWA; by then Ministry of Economics and Labor) launched the *InnoNet* program that was aiming at promoting joint projects between small and medium sized enterprises (SMEs) and public research institutes (like Fraunhofer institutes). At least two institutes and four SMEs should be involved into the joint project, which has to be coordinated by a research institute. There are no restrictions in terms of type of technology or the regional dimension of the network. Those proposals that receive public funding in the InnoNet program are selected in two rounds. In the first round the administration

[8] For further information see URL http://www.innoregio.de and http://www.diw.de/innoregio

evaluates the rough project outlines submitted. In a second round the selected projects are asked to elaborate a more detailed application. Within three months an independent jury consisting of national representatives of universities, research institutes, companies and associations (no members of the Ministry) decides on the promotion of the applied projects. The program is terminated the end of 2005[9].

- *NEMO* (*Ne*tzwerk *M*anagement *O*st) was started by the BMWA in February 2002. The program is aiming at promoting the development and organization of SME networks mainly in East Germany. A network in the sense of this program consists of at least six small and medium sized companies as well as public research institutes aiming at specific self-defined technology fields(e.g. research and development, commercialization of research output). The program is restricted to networks in East Germany. The program provides support of network management that has to be co-financed by the network partners.

- The program *kompetenznetze.de* was introduced in 1998 with two goals. First, providing and presenting internet–based information about innovative (mostly regional) networks in Germany. And second, to support networks by providing a platform for communication and information as well as by offering workshops and conferences on issues relevant for the network managers. There is no further funding. Applications can be submitted twice a year. An advisory board consisting of eight members from science, industry and the German chamber of commerce evaluates the applications and decides about funding[10].

- The BMBF-program *Lernende Regionen* (learning regions) started in October 2000 and supports the building and maintenance of regional networks for education and learning. Members of networks can be schools

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[9] For further information see URL http://www.forschungskoop.de and http://www.vdi-vde-innonet.de

[10] For further information see URL http://www.kompetenznetze.de

and other education institutions, training companies and social or cultural organizations. Until 2006 a volume of 118 mill. Euro has been set aside for this program. There are two steps of promotion. The first is a planning phase of one-year. In a second step, the realization of the project can be funded for a period of up to four year if the first phase is evaluated positively. Applicants are selected not by an independent jury but by a steering committee consisting of members of the ministry and representatives of the administration of all Länder.[11]

In all these programs, no subsidy or compensation was given for preparing the proposal that was initially submitted.

6. Experiences with contests: some preliminary evidence

In this section we report experiences made with the contest approach in German innovation policy. The available evidence on the effects of the programs is still rather limited, mainly, because most of the programs are still in operation so that there is no ex-post evaluation possible. In addition, most of the programs were not subject to any complementary evaluative research. Up to the present, BioRegio is the only example of this program type that has been officially completed. Although, there is no detailed final assessment of its effects available[12], this program is deemed rather successful (Dohse 1998, Cooke 2002).

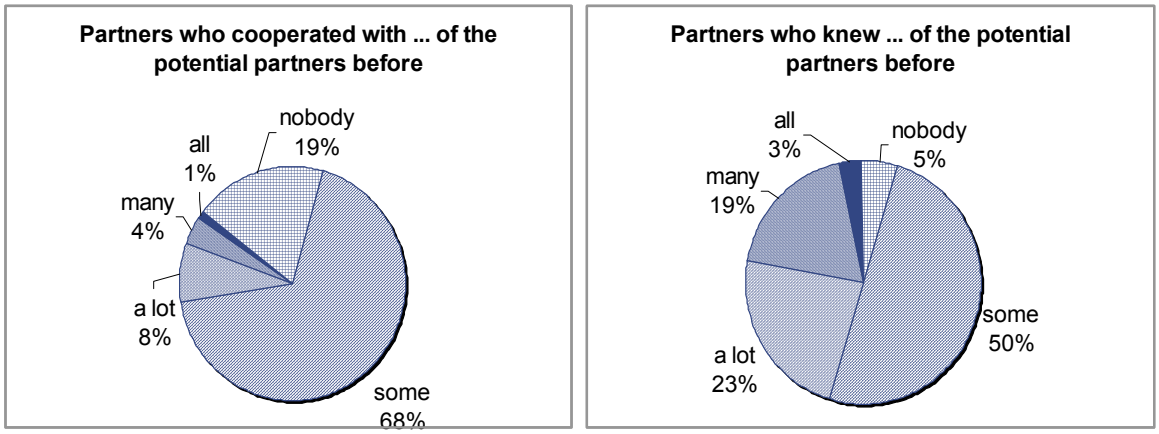
Incentive for self-organization: When initiatives submit their proposal to the administration they have already made the first important step towards self-organizing their future division of labor and building a regional network. For the InnoRegio program this effect can be demonstrated using data of an inquiry of successful initiatives that have been selected for funding. Participants of the

[11] For further information see URL http://www.lernende-regionen.info/dlr/index.php

[12] The Federal Ministry of Education and Research did not support any complementary evaluation for the BioRegio program. In the case of EXIST, InnoRegio and InnoNet such complementary evaluation was implemented at an early stage of the program.

winner regions were asked whether they did cooperate with their InnoRegio partners before the application procedure and whether they knew each other (figure 1). Only a minority of 5 percent of the participants had cooperative relationship with most of the partners (categories: “many” 4 percent and “all” 1 percent) before the contest, while nearly one fifth of the partners (19 percent) did not cooperate with any of the partners of the InnoRegio network (“nobody”). However, 68 percent had cooperative relationship with “some” of the InnoRegio partners before. As could be expected the share of partners who knew each other before is higher: About one fifth (22 percent) of them knew “many” (19 percent) or “all” (3 percent) of the partners involved while only 5 percent knew none of them. According to these results there can be no doubt that the InnoRegio contest had some considerable mobilizing effect on self-organization of the network.

Figure 1: Relationship of InnoRegio partners before participating the contest (percentage)



Source: DIW Berlin, Survey in 2000, N=727.

Mobilization of innovative potential: Another indicator for the mobilization effect of a program is the number of applications submitted in the contest. The number or the share of non-successful applications can be regarded as indicating mobilization “surplus”, i.e. induced initiatives that are not funded. For the first contest realized by the BMBF, BioRegio, 17 regional

networks applied for promotion and only four of them, about a quarter, were selected for further promotion (table 2). In many of the succeeding programs the mobilization surplus was much higher: 30 regions applied for BioProfile20 of them were accepted for the second round of the contest and three regions finally received funding. In BioFuture 43 grants were awarded in five different contests. The EXIST contest was realized at the end of 1997. All in all, only 5 percent of the applications were successful. The number of 109 applications to the EXIST program shows a much higher mobilization effect than for the BioRegio program with only 17 submission. The reason for that may be that EXIST was not restricted to a specific technological field and thus attractive for a greater number of potential applicants. The largest program, both in terms of financial volume (250 mill. Euro) as well as with regards to the number of submissions is InnoRegio. The number of 444 applications to the InnoRegio contest can be judged a big success in terms of mobilization effect, particularly because the contest was restricted to East Germany. In the InnoRegio program the share of applications that were finally granted is quite low. Only 25 out of 444 applications were successful. Two of them failed in the course of time, so that as the end of 2003 only 23 networks are still part of the InnoRegio program. The share of the mobilization surplus amounts to about 95 percent. However, most of the other programs had higher winners quotas (table 3). To sum up, the contests conducted so far had a considerable mobilization effect. In most of these programs the mobilization surplus, i.e. the applications that finally did not receive funding was more than 70 percent. One may well presume that this mobilization surplus effect is at least as important as the funding of the winners. This supposition can, however, hardly be proven empirically. Until the end of 2003 in the program “Lernende Regionen” two contests were conducted, one in June 2000, one in April 2000. In the first round 54 out of 250 applications were selected for the planning phase, in the second round 27 out of 100. Some of them failed in the second phase of qualifying the proposal. Thus, at the end of 2003 only 72 instead of 81 regional networks were funded, one quarter of the initial number of applicants.

Table 2: Applications for selected Contest oriented programs in support of regional innovation co-operation in Germany (as of end 2003)

Name of program	*Number of contests*	*Year(s) of contests*	*Number of submitted applica-tions*	*Number of granted applica-tions*	*Share of applications not granted (percent)*
BioRegio	1	1995	17	4	76
BioProfile	1	1999	30	3	90
BioFuture	5	1999, 2000, 2001, 2002, 2003	n.a	43	
EXIST	1	1997	109	5	95
EXIST Transfer	1	2002	45	10	78
InnoRegio	1	1999 to 2000	444	23	95
NEMO	3	2002, 2003	209	55	73
InnoNet	5	1999, 2000, 2001, 2002, 2003	404	51	87
kompetenznetze.de	8	n.a.	n.a.	n.a	40
Lernende Regionen	2	2000, 2001	350	72	79
Source: Own compilation.					

Need of time: The period between the call for submissions for the contest and the first transfer of funds varies between the different programs. Compared to the case-by-case decision on funding additional time is needed for conducting the contest. For example, the BioRegio contest lasted about one year. In the EXIST-program the contest also took about 12 months. In EXIST Transfer about five months were required, in InnoRegio the time fort he contest was 20 months and in InnoNet one year. It is not all easy to assess the effects of the additional time needed for the contest compared to decisions made on a case-by-case basis. For BioRegio participants interregional competition is despite the time needed viewed as a appropriate selection mode. Not only the winners but also the losers made that statement (Dohse 2000). In contrast, the InnoRegio contest participants complained in the early stage of the process about the complex and long lasting decision procedure (Eickelpasch, Kauffeld and Pfeiffer 2002). Especially those participants who planned to realize high-tech projects were afraid to lose important first-mover advantage over of the long-lasting selection period. In InnoNet similar complaints were expressed. It was argued that a contest period of one year is too long with regard to short innovation cycles in the technological fields concerned (Belitz, Pfirmman,

Eschenbach 2002). It was recommended to shorten the contest to a period of half a year.

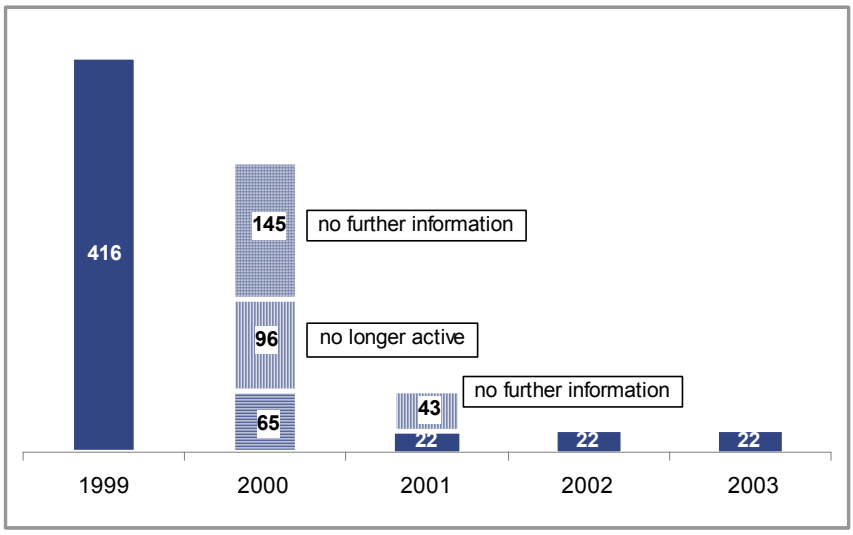
Learning effects for policy makers and administration: The administration obviously used the experiences made in the contests for the improvement of their programs in different ways. For example, the BioRegio program was – when it was proved to be successful – followed by some other programs also focusing on biotechnology, partly as contests. Thus, the contests BioFuture as similar to BioRegio and BioFuture benefited from the experiences of BioRegio. In addition, other programs like BioChance and BioChancePlus[13] were implemented. Similarly, the EXIST Transfer contest as well as the EXIST-Partner-program are to be seen as successor programs of EXIST, which were built on the experiences made. The experiences gained in the implementation of InnoRegio were transferred to the Wachstumskerne-program. In the InnoNet program that was designed as a program with several contests the administration could cut down the length of the contest period considerably (Beelitz, Pfirrmann and Eschenbach 2002).

Discouragement of losers: It is quite obvious that those who lost the contests may be frustrated at first hand and thus the propensity that initiatives will be abandoned is quite high. In general, the initiatives which lost the contest may be divided into two groups, those who are still active after a certain period of time trying to realize their concept - at least partly - and those who are not. There is only limited empirical evidence in how far losers are discouraged or not. In the EXIST contest 109 proposals were submitted in the first step, 105 of them were not selected for further funding. Three years after the selection of the winners was made, a study by Krantz, Lilischkis and Wessels (2000) investigated what happened to the EXIST initiatives that did not receive funding. 79 percent of the 47 contest-losers that were included in the study were realizing their project, mostly in a modified way. The

[13] The aim of the BioChance program which started in 1999 was to support young firms (not older than five years) by co-financing market-oriented high-risk R&D projects in the field of biotechnology. BioChancePlus as the successor program started in 2003.

realization was partly financed by the federal states (Bundesländer), partly financed by private investors. In the first phase of the InnoRegio contest 416 applicants lost. In 2000 210 initiatives were still active, 96 were not longer active (mostly because of lack of financing) whereas for 110 initiatives no information is available (figure 2). Four years after the contest at least 22 initiatives were still exiting and in the phase of realizing their proposals, partly financed by private investors partly funded by the federal or the federal government. The complementary research of the InnoNet program asked the applicants for their evaluation of the contest realized. According to the results most of the applicants agreed with the selection procedure, both winners as well as by the losers. The main reason for the positive evaluation was, that there were two phases of application which reduced the effort for application in the course of the first round and made it possible to be eventually consulted by the administration in the course of the second round (Belitz, Pfirmman and Eschenbach 2002). To conclude, it can be stated, that the discouragement effect of contest for losers is not as high as could be expected: Some of the initiatives pursue their initial aims, but it is also quite clear that – not surprisingly – for the realization of the concepts further funding is necessary.

Figure 2: Development of the InnoRegio-initiatives of 1999 (as of December 31, 2003)



Source: DIW Berlin.

7. Conclusions

To allocate R&D subsidies by means of a competition has many advantages. One of these advantages is the chance to generate relatively strong mobilization effects and, therefore, a high impact of public funds. Another merit is a relatively low level of pretence of knowledge that may be associated with this kind of policy. The degrees of freedom that actors have with regard to the design of their projects may induce considerable learning effects on the side if the applicants as well as for policymakers. The openness of the approach gives policy makers a good opportunity to learn about the needs and requirements of their clientele and to include these experiences in the design of other programs. And competition for funding may have quality enhancing effects on the design of the concepts that are submitted. The main disadvantage of this policy approach is the additional time needed for the conducting a contest. Contest procedures should operate quickly so that applicants do not loose too much of an early-mover advantage. And, as a 'picking the winner'-approach contests are not suited as a means of a leveling-out policy that is aiming at economic cohesion.

In the future, contests will probably be of growing importance for German innovation policy, as official statements indicate (Blum 2001, BMBF 2002). Further research will be needed to investigate thoroughly the effectiveness of contests for innovation policy. A main focus of this research should be on the implementation of the programs because this issue appears to be of crucial importance for the advantages of the approach to become effective.

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